

REMARKS

The Rejections

Claims 1-4, 6, 7, 9, 10, 12-15, 17, 18, 20-22 and 24-26 were rejected only under §102(b) as lacking novelty or being anticipated by Carr. The remaining dependent claims were rejected only under §103(a) as being unpatentable over Carr.

Carr U.S. Patent 3,148,697

The Carr reference discloses inlet and outlet valves for a piston-type gas compressor such as an air compressor with a reciprocating piston. Figs. 5 and 6 disclose the detailed construction of the outlet or discharge valve and Figs. 7-9 disclose a similar construction of the inlet or suction valve. As shown in Figs. 5 and 6, the discharge valve has an air inlet section 26, a ball head 27 which engages the seat 28 when the valve is closed and engages a stop 34 when the valve is opened. Downstream of the seat, the valve body has a spherical surface 29 with a constant radius which opens onto ball guides 33 having a smaller diameter 33a which guide the ball between its opened and closed positions. Optionally, the ball 27 is yieldably biased to its closed position by a spring 40. The inlet or suction valve is described as having a similar construction.

These outlet and inlet valves do not regulate the pressure downstream of their seats, rather they are simply check valves which open and close in response to pressure changes in the gas in chamber 10 produced by the reciprocating piston of the compressor. The primary object is to provide improved compressor performance by a valve construction which is highly responsive to rapid pressure changes in high speed compressors and to reduce the kinetic energy loss due to flow through these check valves.

Independent Claims

Each of the independent claims 1, 12, 20 and 24 has been amended to obviate the rejection of these claims only under §102(b) as being anticipated by Carr.

Claims 11 & 12

As amended, each of independent claims 11 and 12 defines a pressure control valve having among other things:

- (1) at least one surface of a valve bore with a diameter that increases non-uniformly from its upstream end adjacent the valve seat to its downstream end,
- (2) a valve head movable to open positions against the bias to regulate the pressure of fluid flowing downstream of the valve head, and
- (3) adjacent surfaces of the valve head and valve bore configured to define an interface angle between the longitudinal axis and the interface line interconnecting the point on the valve head surface closest to the valve bore surface and a point on the bore surface closest to the head surface so that the interface angle increases as the valve head is increasingly displaced from the valve seat.

Carr does not disclose, suggest, teach or have any of these three elements, much less all three of them, and hence amended independent claims 1 and 12 define novel subject matter over and are not anticipated by Carr.

Claims 20 & 24

As amended, independent claims 20 and 24 each define, among other things,

- (1) at least one surface of the valve bore which increases non-uniformly from its upstream end adjacent the valve seat to its downstream end,
- (2) a surface of a valve head movable to open positions to regulate the pressure of fluid flowing through the valve bore downstream of the valve head , and
- (3) the surfaces of the valve bore and valve head configured to provide an effective area of a valve head acted upon by fluid tending to move the head away from the valve seat which area increases as the valve head is increasingly displaced away from the valve seat.

Since Carr does not disclose, suggest, teach or inherently have any of these elements, much less all three of them, amended claims 20 and 24 define novel subject matter over and are not anticipated by the Carr reference.

Accordingly, as amended, all of the independent claims 1, 12, 20 and 24, and hence all of the claims 1-26, define novel subject matter over and are not anticipated by Carr for at least the foregoing reasons.

Patentability

Reconsideration and withdrawal of the rejection of dependent claims 5, 8, 11, 16, 19 and 23 as being unpatentable under §103(a) in view of Carr is requested in view of the foregoing amendments and the following comments.

The subject matter as a whole defined by each of claims 1-26 is not disclosed, suggested, taught, inherent or made obvious to one of ordinary skill in the art because Carr does not disclose

the basic concept of applicant's invention, its specific construction and arrangement as defined by any of these claims, or its significant practical advantages, all of which are part of the subject matter as a whole must be considered in determining patentability.

Carr does not disclose applicant's basic concept of a valve which regulates the pressure of the fluid flowing through it downstream of the valve head, any construction and arrangement for doing so, much less applicant's specific construction and arrangement, nor its significant practical advantages of providing over a wide range of fluid flow rates a known pressure curve and particularly a relatively flat curve or constant pressure, a construction which is extremely economical to manufacture and assemble, can be readily mass produced, and is rugged, durable and reliable.

Carr teaches away from applicant's invention defined by the claims by disclosing simply a check valve which is movable to an open position bearing against the stop, has a spherical surface 30 with a constant radius and thereby has a diameter that increases uniformly from its upstream end and does not have any of the three elements noted above.

Applicant respectfully disagrees with the assertions in the Office Action as to what Carr discloses to skilled persons. However, it is believed that in view of these comments and noted differences between Carr and the claimed invention, it would serve no useful purpose to set forth in detail a response to each assertion of what Carr discloses and teaches.

Accordingly, for at least the foregoing reasons, each of dependent claims 5, 8, 11, 16, 19 and 23 is believed to define patentable subject matter over Carr and indeed all of the claims are believed to do so.

Conclusion

As amended, all of the claims 1-26 are believed to define novel and patentable subject matter under §102 and §103 over the Carr reference and to be in a proper form and condition for allowance. Accordingly, reconsideration and allowance of all of the claims as amended is respectfully requested.

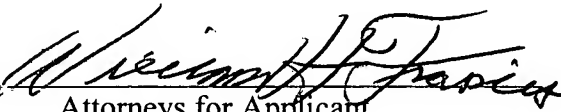
If, after considering this Response, the Examiner is of the view that any of the claims are not allowable, a telephone interview is hereby requested with applicant's undersigned attorney, William H. Francis, so that immediate consideration can be given to any further amendments suggested by the Examiner or otherwise needed to place all the claims in a condition for allowance. The Examiner is asked to either initiate or schedule a time for this interview by telephoning William Francis at (248) 689-3500 who normally can be reached Monday through Friday between 9:00 A.M. and 5:00 P.M.

We believe no fees are due with this Response; however, if the Patent Office determines otherwise, it is hereby authorized and respectfully requested that any fees due be charged to our Deposit Account No. 50-0852.

Respectfully submitted,

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WHF:sal

By 
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